

cies, reminding us somewhat by its general appearance those occurring in Cuba.

The specimens before us are all of the female sex, and measure two inches and a quarter in total length, in which the head enters about five times. The head itself is rather short, whilst the mouth is proportionally large. The diameter of the eye enters thrice in the length of the side of the head. The dorsal fin is higher than long, somewhat convex superiorly. The caudal is rather short and subtruncated posteriorly. The anal is deeper than long and a little broader than the dorsal; the middle of its insertion corresponding to the anterior margin of the dorsal. The ventrals are very small and far from reaching the vent with their extremities. The pectorals are of moderate development, spear-shaped when not expanded. The rays are:—D 9; A 10; C 6, 1, 7, 7, 1, 6; V 6; P 12.—The middle rays of the dorsal and anal fins exhibit bifurcations of the second degree conspicuously developed. The scales are of moderate development. The body is chestnut brown, and the abdomen yellowish golden, with blackish specks along the middle of the flanks to the caudal fin. The periphery of the scales is margined with black. The dorsal, caudal and anal fins are greyish and speckled, the ventrals and pectorals being olivaceous.

To distinguish this species from its congeners, the name of *G. senilis* is here proposed.

On the Primary Divisions of the SALAMANDRIDÆ, with Descriptions of Two New Species.

BY E. D. COPE.

Class AMPHIBIA. Order CADUCIBRANCHIATA. Sub. Ord. URODELA.

Fam. 1. PROTONOPSIDÆ. Branchial apertures persistent. (Trematoderes Dum. & Bibr).

Fam. 2. SALAMANDRIDÆ. Branchial apertures none. (Aretoderes Dum. & Bibr.)

The characters of the following subfamilies are taken from the position, etc., of the palatine and sphenoidal teeth, and we are of the opinion that the groups thus formed will be found to be more natural than those established exclusively upon the form of the tongue.

1. AMBYSTOMINÆ.

Palatine teeth upon elevated processes of the vomero-palatine bones, in straight or arched transverse series only, sphenoidal teeth absent. Tongue large, thick, papillose, but slightly free. Form stout. Skin mostly smooth. North America.

1. MEGALOBATRACHUS (Tschudi) 1838. Syn. *Cryptobranchus* Van der Hoeven, 1838. *Sieboldia* Bonaparte, 1850. *Tritomegas* Dumeril & Bibron, 1850.

The great aquatic Salamander of Japan is closely allied to our *Protonopsis* (*Menopoma* Harlan), but the absence of branchial slits places it among the true Salamanders. By the position of the palatine teeth it evidently belongs to the present subfamily, and not among the Tritons, as placed by Dr. Hallowell. (Journ. Acad. Nat. Sci., vol. iii. Second Series, p. 357).

2. CAMARATAXIS Nob. Palatine teeth upon four processes, the two posterior short oblique, and behind the internal nares; the anterior forming an arch, interrupted at the palatine suture, and concentric with the maxillary series. Tongue broad, thick, papillose, attached by the whole posterior border, slightly free laterally. Extremities stout, digits free, 4—5. Tail not long, compressed.

[April,

C. maculata.—*Ambystoma maculatum* Hallowell, Journ. Acad. Nat. Sci., Second Series, vol. iii. p. 355.

This species, which inhabits New Mexico, makes the nearest approach to the preceding genus in the form of the series of palatine teeth. In this respect it also exhibits too great a departure from the straight or slightly angular series of *Ambystoma*, to remain in that genus.

3. AMBYSTOMA (Tsch.)

The nearest approach to the preceding species, in general appearance and form of the palatine series, is seen in the *Ambystoma nebulosum* of Dr. Hallowell; but the processes are not arched, but straight, presenting an obtuse angle forward.

The genus *Xiphonura* Tschudi (*Heterotriton* Gray) does not seem to be sufficiently distinct either with respect to dental peculiarities, or the form of the tail. Though *Ambystoma ingens*, *luridum*, and *Californiense* resemble each other in these points, and are quite different from the *A. opacum*, yet by the intervention of such species as *A. tigrinum* (Green)—*fuscum* (Hallowell)—*bicolor* (Hall.)—*punctatum* (Linn.), which show a regular gradation of form, the hiatus is filled, and no generic division can be made.

The following species appears to be undescribed:

A. conspersum.—Head oval, rather large; extremities slender, fourth toe twice as long as second; tail not longer than body, much compressed; tongue elliptical, very slightly free at the sides; palatine teeth in two short patches between the internal nares, presenting a concavity backwards. Length 1 inch 10 lines: head 4 l.: body 9 l.: tail 9 l. Head, back and tail cinereous brown, finely speckled with white dots, which are confluent on the snout. An indistinct row of white spots on the sides. Beneath dirty white.

Londongrove, Chester Co., Pennsylvania.

The animal described was probably not fully grown, so that though the measurements indicate the smallest known *Ambystoma*, the adult may be larger. We are unable to refer it as the young of any of our Pennsylvania *Ambystomata*. The form of the tail would indicate aquatic habits, but it was found in the woods, and when placed in water showed the greatest aversion to it.

It resembles *Ambystoma porphyriticum* of the Academy's collection, but differs in color of abdomen, lateral series of spots, and larger head and mouth. (We allude to the specimen from the Wabash, presented by Dr. McMurtrie). The two latter points, it will be noticed, are those in which this Wabash specimen differs from Prof. Green's description, according to Dr. Hallowell. (Proc. Acad., Feb. 1856). *A. porphyriticum* has as yet been found west of the Alleghanies only. The young of *A. laterale* (Hall.) is not known, nor has the geographical distribution of that species been well ascertained. We have been unable to find Gray's description of his *A. punctulatum*, which is, however, a Californian species.

4. ONYCHODACTYLUS (Tsch.)—The genus *Ensatina* (Gray) which is stated by Dr. Hallowell (Proc. Acad. Nat. Sci. vol. 8, p. 238) to be destitute of sphenoidal teeth, may enter this subfamily.

2. SPELERPINÆ.

Palatine teeth in short series upon transverse processes of the palatine bone; sphenoidals numerous, aggregated upon two thin, ovate or elongate bony plates (becoming cartilaginous), which lie longitudinally and contiguously upon the sphenoid bone. Tongue (generally) thin, borne upon the much exerted cartilaginous elongation of the os hyoides; some genera with an additional anterior membranous attachment. Form slender; skin smooth. North America and Europe.

1859.]

I. PLETHODONTÆ.

Tongue with a membranous attachment from the pedicel to the anterior edge, leaving the lateral and posterior borders more or less free.

1. *PLETHODON* (Tsch.)—The tongue in this genus is not attached by its posterior border, as described, though very slightly free.

2. *DESMOGNATHUS* (Baird).—*D. auriculata* (Holbrook). *D. nigra* (Green).

D. fusca (Green). *Salamandra quadrimaculata* (Holbrook) is undoubtedly the young of this species.

The teeth of this species—as in all others of the *Spelerpinæ* that we have examined, are acrodont. Superior and inferior maxillaries slightly curved, compressed; summits truncate, having a cutting edge interiorly, and a sharp point exteriorly, with a crescent-shaped depression between. Color hyaline, point and edge amber. Sphenoidals more cylindrical and incurved.

D. ochrophæa.*—Form more slender than *D. fusca*, less so than *Pleth. erythronotus*. Tail as long as the head and body, subquadrangular at base, beyond, slender and slightly compressed. Thirteen distinct costal folds. Length 2 inches 11 l.; tail 17 l.

Color above, varying from bright to dirty and fuscous straw color, most specimens with an indefinite medial row of irregular brown spots, a deep brown line passing through the eye and along the dorso-lateral region of the body to the end of the tail; distinctly defined along its upper edge; fading into fuscous marblings on the sides. Belly pure white.

Susquehanna County, Pennsylvania.

This is a terrestrial species, and very common beneath the bark of hemlock logs. We have never noticed it in the South-eastern part of Penna., but it has probably been passed over as *Spelerpes bilineata*, to which it bears considerable resemblance, or as a pale variety of *Plethodon erythronotus*. From the latter it differs in attachment of tongue, less slender form, want of marblings on the belly, etc. Brownish yellow takes the place of red on the back, though the young have indications of the same indefinite pink spotting as in that species and *Desm. fusca*.

3. *ANEIDES* (Baird.) 4. *HEREDIA* (Girard.) 5. *HEMIDACTYLUM* (Tsch.) Is *Salamandra melanosticta* (Gibbes) identical with *H. scutatum* (Tschudi)?

II. SPELERPÆ.

Tongue bolætoïd—attached by a central pedicel only.

6. *BATRACHOSEPS* (Bp.) 7. *SPELERPES* (Raf.) 8. *EDIPUS* (Tsch.) 9. *GROTRITON* (Bp.)

10. *PSEUDOTRITON* (Tsch.) The teeth of this species exhibit the following peculiarities. Acrodont, much incurved, cylindrical, with a central pulp

* Since the above was sent to press, we have been informed by Prof. Baird that he considers this animal identical with *Salamandra Haldemani* (Holbrook) which he is of opinion is one of the "very numerous varieties of *Desmognathus fusca*." We have never seen Prof. Holbrook's original specimens of *S. Haldemani*, but it has been represented by all subsequent authors to be a *Spelerpes* (*Cylindrosoma* D. & B.), a genus differing from *Desmognathus* in its boletoid tongue. We would also hazard a doubt as to the identity of this animal with *Desm. fusca*. The latter is decidedly aquatic in its habits, living beneath stones, etc., in rapid streams.

The former we have never seen in the water, but have invariably found it beneath bark, under logs, etc. It is rather sluggish, resembling *Plethodon erythronotus* in this respect. Should this animal be the *Salamandra Haldemani* of Holbrook, it will stand as *Desmognathus Haldemani* Nob.

[April,

cavity, terminating in two points, the interior much larger than the exterior; both of a bright amber color, the body of the tooth being hyaline in appearance. The palatines are similar to the superior maxillaries, the inferior maxillaries only differ in being flattened on their inner side, and the sphenoidals in being more curved.

3. HYNOBIIINÆ.

Vomero-palatine bones destitute of teeth, posteriorly elongated and cuneiform, occupying a deep emargination in the outline of the sphenoid bone. Sphenoidal teeth present, upon the outer edge of two ridges of the sphenoid bone which lie along the sphenoido-palatine suture, thus forming two longitudinal series closely approximated posteriorly, widely diverging and becoming transverse, anteriorly. Tongue rather large, much attached. Very aquatic species. Japan.

This subfamily presents a singular and very distinct modification of the arrangement of teeth on the palate.

Tschudi has distinguished generically the only two species of this subfamily, under the names *Pseudosalamandra* and *Hynobius*, and apparently upon insufficient grounds. MM. Dumeril and Bibron have united them under the name *Ellipsoglossa*, but as Tschudi's names have priority, one or the other of them must be adopted. We select as the least objectionable

1. *HYNوبيUS* (Tsch.) *H. nebulosus* (Schl.) *H. naevius* (Schl.)
Pseudosalamandra nævia Tsch. Class. 1838. *Molge striata* Gray, Cat. Brit. Mus. 1850.

4. SALAMANDRINÆ.

Palatine teeth upon the inner edge of processes of the palatine bones, which are elongated horizontally and posteriorly over the sphenoid. No transverse palatine series. Tongue generally thick, and seldom free to much extent. Skin mostly rough, or changing with the habitat. Form usually stout. Europe, North America and Japan.

It would appear as though herpetologists had not given the same attention to the clear definition of their genera among the animals of this subfamily, as elsewhere. In the following brief synopsis, the diagnoses of the genera have been drawn up with reference to and including only the *distinctive* characters.

I. SALAMANDRÆ.

Palatine processes slender, curved, approximating posteriorly. Ribs not developed. Terrestrial species.

1. *SALAMANDRA* (Laurenti.) Palatine teeth in two curved series, approximated posteriorly. Tongue oval, thick, slightly free at its edges. Digits free, 4—5. Parotids large, porous. Tail moderate, cylindrical.

S. maculosa (Laurenti.) *S. corsica* (Savi.) *S. atra* (Laurenti,) 1768.
S. nigra, Gray, Cat. Brit. Mus. 1850.

II. PLEURODELÆ.

Palatine processes cuneiform. Ribs greatly developed, sometimes piercing the skin. Terrestrial and aquatic.

2. *SALAMANDRINA* (Fitzinger.) Palatine series nearly in contact at their anterior extremities, for a short distance almost parallel, then widely diverging. Tongue ovate, broad behind, free laterally and posteriorly. Digits 4—4. Tail subcylindrical.

S. perspicillata Fitz. 1826. *Sciranota condylura* Barnes, Silliman's Journ. v. ii. p. 278.

3. *PLEURODELES* (Michaelles.) Palatine teeth in two parallel series, whose anterior extremities are considerably in advance of the internal nares, and 1859.]

slightly converging. Tongue small, oval, free posteriorly and laterally. Parotids present, porous. Digits 4—5. Tail long, compressed.

P. Waltli (Mich.)—*Salamandra pleurodeles*, Schlegel, Fauna Japonica, p. 117. ? *P. exasperatus* (Dum. & Bibr.) Erp. Gen. vol. 9, p. 420.

4. BRADYBATES (Tschudi.) Palatine teeth few. Tongue small, round, attached by its whole inferior surface. Extremities short, small; digits 4—5. Body depressed, no parotids. Tail short, broad at base, subcylindrical.

B. ventricosus (Tsch.)

III. TRITONES.

Palatine processes cuneiform. Ribs not developed. Habits aquatic, many species furnished in the breeding season with dorsal crests, and interdigital membranes.

5. GLOSSOLIGA (Bp.)—Longitudinal series of palatine teeth in two widely separated rows, slightly converging anteriorly. A strong postorbital arch, formed by the union of a process of the posterior frontal with that of the tympanic bone. Maxillary bone uniting immediately with the pterygoids. Tongue rounded, free posteriorly and laterally. Digits 4—5. Tail moderate, somewhat compressed.

A remarkable genus, quite distinct in many points of structure from *Euproctus*, with which Dum. & Bibron unite it.

G. Poirreti (Gervais.)

6. DIEMYCTYLUS (Rafinesque.)—Longitudinal series of palatine teeth in two straight rows, closely approximated anteriorly, widely diverging posteriorly. A strong long arch above and behind the orbit formed by the united processes of the posterior frontal and tympanic bones. Tongue small, thick, oval, attached by its whole inferior surface or with a very slightly free lateral border. Digits 4—5, the exterior and interior upon the hind feet rudimentary. Tail moderate, compressed.

Syn. *Diemyctylus* Rafinesque, 1820. *Notophthalmus* Raf., 1820. *Cynops* Tsch. 1838. *Taricha* Gray, 1850.

We regret that the law of priority compels us to employ Rafinesque's objectionable name in preference to *Cynops* Tschudi or *Taricha* Gray. We prefer *Diemyctylus*, though apparently unmeaning, to the egregiously inappropriate *Notophthalmus* of the same date.

D. torosus.—*Triton torosus* Esch. Zool. At. pt. v. pl. 21. fig. 15, 1833. *Triton Ermanni* Weigmann, 1835. *Triton granulatus* Skilton, 1849. *Taricha torosus* Gray, Cat. Brit. Mus., 1850.

The external characters of this animal present no peculiarity that appears to us to warrant generic separation from the succeeding species.

? *D. laevis*.—*Taricha laevis* Bd. & Girard, Proc. Acad. Nat. Sci. vol. 6, p. 302.

D. pyrrhogaster.—*Molge pyrrhogastra* Boie, Isis, p. 215, 1826. *Salamandra suberistata* Schlegel, Fauna Japonica, p. 135, 1833. *Cynops suberistatus* (Tsch.) Class. der Batrachier, p. 94, 1838. *Cynops pyrrhogaster* (Gray,) Cat. Brit. Mus. 1850.

This species in the development of the temporal region exhibits characters most typical of the genus. We fail to perceive the generic difference admitted by authors to exist between this and the following species.

D. viridescens.—*Triturus* (*Diemyctylus*) *viridescens* Raf., 1820. *Triturus* (*Notophthalmus*) *miniatus* Raf., 1820. *Salamandra symmetrica* Harlan, 1825. *Salamandra dorsalis* Harlan, 1828. *Salamandra millepunctata* Storer, 1838. *Triton millepunctatus* DcKay, 1842. *Triton dorsalis* Hall, 1842. *Triton symmetricus* Dum. & Bibr., 1854.

We include in the above synonymes those of the nominal species *D. miniatus*, which we think with Dr. Hallowell (Proc. Acad. Nat. Sci. Feb. 1856) is a state of *D. viridescens*. We have caught specimens with or

[April,

without the dorsal or ventral spots; destitute of, with rudimentary, or fully developed crests; and of every shade of color between vermilion and brownish green. The color and character of the skin seem to be dependent upon the amount of moisture in the situations in which they are found. Those from high and dry spots are redder and rougher than those from marshy situations: while those whose habits are for the time aquatic, are still greener and smoother, and exhibit every degree of development of the dorsal crest. Thus it is probable that this species undergoes changes similar to those of the European Tritons, as detailed by Schlegel and Kaup.

7. *EUPROCTUS*, (Gené.)—Series of palatine teeth closely approximated anteriorly, posterior extremities widely diverging. Skull elongated, depressed. A weak post orbital arch formed by the slender processes of the posterior frontal and tympanic bones. Superior maxillary bone uniting with the pterygoid by the intervention of a jugal bone. Tongue oval, free behind and at the sides. Anal region frequently prolonged. Digits 4—5. Tail compressed.

E. platycephalus (Otto.)—*Molge platycephalus* (Otto.) 1826. *Euproctus Rusconi* (Bonaparte), 1839. *Euproctus platycephalus* (Gray,) 1830. *Euproctus puncticulatus* (Dum. & Bibr.)

This and the following three species have been described by MM. Dum. & Bibron as Tritons, but are considered by M. Alfd. Duges (Osteologie et Myologie des Batraciens) as varieties of *Euproctus platycephalus*. The present species is evidently a *Euproctus*, judging from the figure of the skull in the *Erpetologie generale*.

E. rugosus (D. & B.) *E. repandus* (D. & B.) *E. Bibronii* (Bell.)

8. *LISSOTRITON* (Bell.)—Series of palatine teeth nearly in contact anteriorly, widely diverging posteriorly. Post orbital arch wanting; posterior frontal bone with a slight projecting supra-orbital border. Tongue moderate, circular, depressed, slightly free all round. Digits 4—5. Tail compressed.

L. punctatus (Latr.)—*Triton punctatus* Auctorum. *Lissotriton punctatus* Bell, 1839. *Lophinus punctatus* Gray, 1850.

The form of the tongue seems to be the only peculiarity which separates this species from the true Tritons. This, though a slight character, is probably better than that upon which Prof. Bell principally relies in establishing the genus—viz.: the smoothness of the skin:—thus including the *Triton palmipes*, and perhaps other species at *proper seasons* of the year.

9. *TRITON* (Laurenti). Series of palatine teeth closely approximated anteriorly, diverging posteriorly. Supra-orbital border of the posterior frontal bone prominent; the process rudimentary or wanting. Tongue small papillose, free at the sides only. Digits 4—5. Tail moderate, compressed.

‡ *OMMATOTRITON* (Gray). Tongue thick, like a wart, lateral borders scarcely free.

Syn. *Ommatotriton* Gray, (1850). *Lissotriton* (Bell) (Pars), 1839. *Lophinus* (Gray), (Pars) 1850.

T. palmipes (Latreille)? *Molge vittatus* Gray, (1820). *Lissotriton palmipes* Bell, (1839). *Triton vittatus* Dum. & Bibr. (1854).

T. alpestris (Laur.)

T. palmatus (Schn.) (1797). *Lophinus palmatus* (Gray), 1850.

‡ *TRITON* (Laurenti). Tongue depressed, considerably free laterally.

Syn. *Triton* (Laur.) Syn. Rep. p. 38, (1768). *Hemisalamandra* (Pars) (Duges), (1852).

T. marmoratus (Latreille). This species stands first in Laurenti's Synopsis of Tritons. In the form of the tongue it approaches, and in osteological characters closely resembles, the *Hemisalamandra cristata*, but the almost parallel rows of palatine teeth in the latter species generically distinguish it.

10. *HEMISALAMANDRA* (Duges), (1852). Palatine teeth in two widely separated rows. [1859.]

rated longitudinal rows, which slightly converge anteriorly. Post-orbital arch wanting. Tongue oval, flat, attached by its anterior and posterior borders, free laterally. Digits 4—5. Tail long, compressed.

H. cristata (Laur.) *Triton cristatus* Auctorum. What species Merrem assigned as the type of his genus *Molge*, we have been unable to ascertain, nor would it seem to be generally well known among herpetologists, from the number and variety of species to which it has been applied. The following are some of them:—*Plethodon erythronotus*, *Hynobius navius*, *Euproctus platycephalus*, *Triton palmipes*, *Diemychylus pyrrhogaster*.

On the genus *CALLIONYMUS* of Authors.

BY THEO. GILL.

In the genus *Callionymus*, as it has been restricted by modern naturalists, three distinct genera are yet confounded. Sharing all of the following characters, two of them differ so much from each other in the position of the branchial apertures, that there can be no doubt of their claims to rank as separate genera. The characters common to all, and which distinguish them as a sub-family, will be first given, and afterwards the generic diagnoses.

The body is elongated, and often transversely oval anteriorly, and consequently broader than high; thence it gradually declines in height and thickness to the base of the caudal fin, and being often quite thick near that fin, assumes there a peculiar bulging appearance. The whole is naked and smooth.

The lateral line commences at the mastoids, and is connected, near its origin, to that of the opposite side by a transverse nuchal line; thence it generally declines slightly, and is then continued along the side of the back or the upper part of the side to the caudal fin.

The head is in general outline depressed and triangular, but varies in detail. The preopercle has a stout horizontal process which generally terminates posteriorly in a group of radiating and recurved spines, one above the other, or which has the spines along the superior border. The profile is oblique. The preorbitals or first sub-orbitals are prolonged anteriorly and frequently extended towards each other, thus forming a roof under which the jaws are concealed when retracted. There appears to be on each side but a single nostril, which is situated before the eye.

The mouth is small and sub-terminal, but under the muzzle, and is protracile downwards.

The teeth are villiform, and present in a moderately broad band in each jaw. The palate is smooth.

The tongue is generally far within the mouth; it is sometimes entirely united to the floor of the mouth, while at other times it is anteriorly free.

The branchiostegal membrane has on each side five or six slender rays.

The branchial apertures are very small and superior.

The first dorsal fin commences before the bases of the pectorals; it varies in shape, but there appears to be a constant arrangement of the rays. These are always four in number, and the first two are approximated at the base, but as the membrane enlarges, diverge from each towards their ends; the third is considerably posterior: the fourth is separated by a still wider interval from the third.

The second dorsal commences a short distance behind the first, is oblong and is distant from the caudal less than its length.

The anal has the form and structure of the second dorsal, but its commencement and termination are posterior to those points of the dorsal.

The caudal is elongated, but narrow, and has only from ten to thirteen articulated rays, of which from one to three of the superior and inferior are simple.

The pectoral fins are well developed, and are angular at the middle of their posterior margins. Their bases are vertical, but concave.

[April,